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Reliability of Fine Needle Aspiration Cytology (FNAC) as a Diagnostic Tool for Cervical Lymphadenopathy: A Comparative Analysis with Biopsy

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ABSTRACT

BACKGROUND: Cervical lymphadenopathy, characterized by neck lymph node enlargement, demands accurate diagnostic methods due to its varied etiology, ranging from benign to malignant conditions. Fine Needle Aspiration Cytology (FNAC) and biopsy are vital diagnostic tools, each with distinct attributes. This study explores the reliability of FNAC compared to biopsy in evaluating cervical lymphadenopathy, aiming to inform clinical decision-making for improved patient care outcomes.
METHODOLOGY: This retrospective, comparative study was conducted in the Department of ENT and Head and Neck Surgery, Apollo Hospital, Chennai, between June 2022 and June 2023. Patients aged 18 years or older were included. There were 70 patients with cervical lymphadenopathies who underwent both fine needle aspiration cytology (FNAC) and histopathology (HPE). The sensitivity, specificity, and Cohen's kappa coefficient were calculated.
RESULTS: Of the 70 patients, 49 had a benign etiology, with Tuberculosis being the most common, while 21 had a malignant etiology, with Hodgkin's Lymphoma being the most common. The majority of patients were in the age group of 35-60 years, and gender distribution was equal. In our study, it was observed that the sensitivity and specificity of FNAC in detecting TB were 76.2% and 98%, respectively; for Lymphomas, it was 68.75% and 100%, respectively; for metastatic secondaries, it was 80% and 100%, respectively; and for reactive lymphadenitis, it was 79% and 87%, respectively (see Table 1). The overall sensitivity of FNAC in our study is 70.6% (95% confidence interval: 68.5-72.7). Cohen's Kappa coefficient for comparing FNAC with biopsy is approximately 0.6016, indicating moderate agreement.
CONCLUSION: Fine Needle Aspiration Cytology (FNAC) is a valuable initial investigation for cervical lymphadenopathy. It is a simple outpatient procedure that offers a rapid and specific diagnosis with minimal discomfort and is cost-effective. One of its primary advantages is the early detection of malignant diseases, enabling timely treatment initiation. However, the success of FNAC relies on two crucial factors: the representativeness of the sample and the high quality of the preparation. Achieving these can be challenging, so the most reliable diagnostic method is still histopathological examination.

Keywords: FNAC, Biopsy, cervical lymphadenopathy, tuberculosis, lymphoma

INTRODUCTION

Cervical lymphadenopathy is a common clinical concern that often necessitates diagnostic evaluation to determine its underlying etiology. The accurate and timely diagnosis of cervical

lymphadenopathy is critical for effective patient management, as it can range from benign reactive changes to malignant neoplastic conditions. In this context, two diagnostic modalities, Fine Needle Aspiration Cytology (FNAC) and biopsy, have emerged as pivotal tools in the armamentarium of healthcare professionals. While both methods aim to provide crucial diagnostic information, they differ significantly in their approach and characteristics, leading to varying levels of reliability in clinical practice.

Fine Needle Aspiration Cytology (FNAC) has emerged as a valuable frontline investigation, enabling rapid and specific diagnosis with minimal invasiveness and cost-effectiveness (1). Enlarged lymph nodes were the first to be diagnosed by fine needle aspiration and are one of the most frequently sampled tissues (2, 3, 4). However, despite its merits, the effectiveness of FNAC depends on the sample's representativeness and the quality of its preparation, presenting inherent challenges in the quest for universally dependable results. This discussion will explore and compare the reliability of FNAC and biopsy as diagnostic techniques for cervical lymphadenopathy, shedding light on their respective strengths and limitations. Ultimately, this analysis aims to assist healthcare providers in making informed decisions regarding the choice of diagnostic procedure for patients presenting with cervical lymphadenopathy, thereby enhancing the overall quality of care and patient outcomes.

MATERIALS & METHODS

This is a retrospective study conducted in the Department of ENT and Head and Neck Surgery at Apollo Hospitals, Greams Road, Chennai, from June 2022 to 2023, covering a period of one year. Ethical approval was obtained from the Institutional Review Board. Patients above 18 years of age of both genders were included. Patients with missing FNAC reports or those who could not undergo biopsy were excluded. Patients with a previous history of proven head and neck malignancy were also excluded. We studied 70 patients who clinically presented with cervical lymphadenopathy and underwent both FNAC and histopathological examination, meeting our inclusion criteria. The preoperative FNAC results were correlated with the final histopathological diagnosis, and we calculated the sensitivity, specificity, and Cohen's Kappa coefficient.

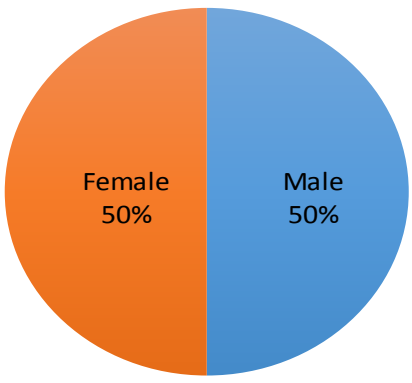
STATISTICAL ANALYSIS

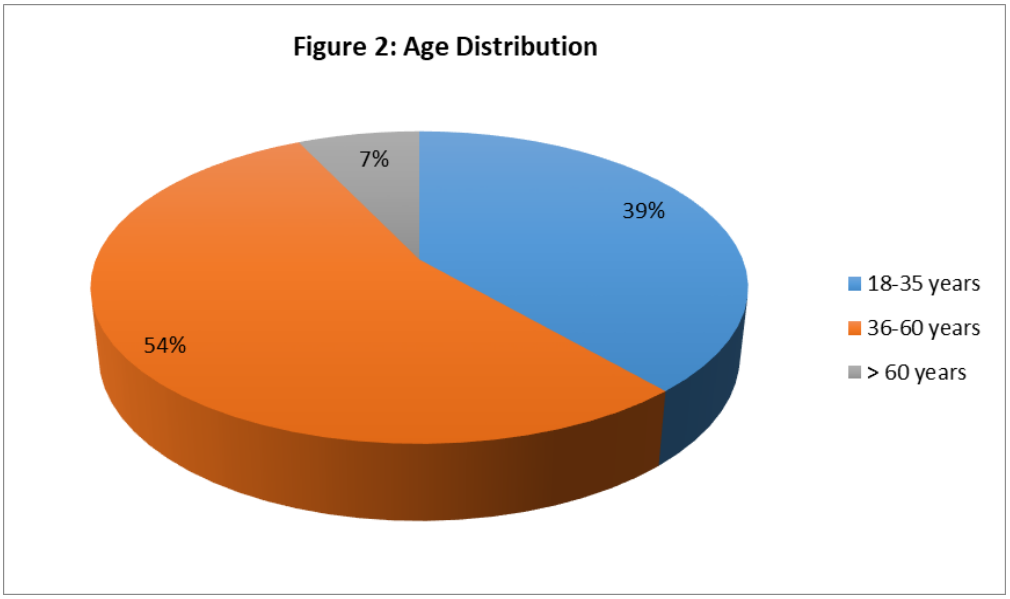
All continuous variables were expressed as Mean ± Standard Deviation. All categorical variables were represented by frequency and percentage. Sensitivity and specificity were calculated between FNAC and HPE. Data entry was performed in an MS Excel spreadsheet. Data analysis was carried out using SPSS version 28.0.

RESULT

In our study during a period of 1 year, 70 patients underwent both FNAC and Biopsy. The gender-wise distribution was equal which included 35 males and 35 females. (Fig 1) The majority of patients were in the age group 36 – 60 years followed by 18 – 35 years and >60 years. (Fig 2)

Figure 1: Gender Distribution





In our study among the 70 patients, 49 patients had benign aetiology of which Tuberculosis was the most common, while 21 patients had malignant aetiology of which Hodgkins Lymphoma was the most common

FNAC was fairly accurate in diagnosing cases of cervical lymphadenopathy (Figure 3,4). In our study, it was observed that the sensitivity and specificity of FNAC in detecting TB was 76.2% and 98% respectively, for Lymphomas it was 68.75% and 100% respectively, for metastatic secondaries it was 80% and 100% respectively and for reactive lymphadenitis it was 79% and 87% respectively. (Table 1). The overall Sensitivity of FNAC in our study is 70.6% (68.5- 72.7) with a 95% confidence interval.

Table 1: Sensitivity and Specificity of FNAC

Histopathological Diagnosis	Sensitivity	Specificity
TB	76.2%	98%
Lymphoma	68.75%	100%
Malignant Secondaries	80%	100%
Reactive Lymphadenitis	79%	87%

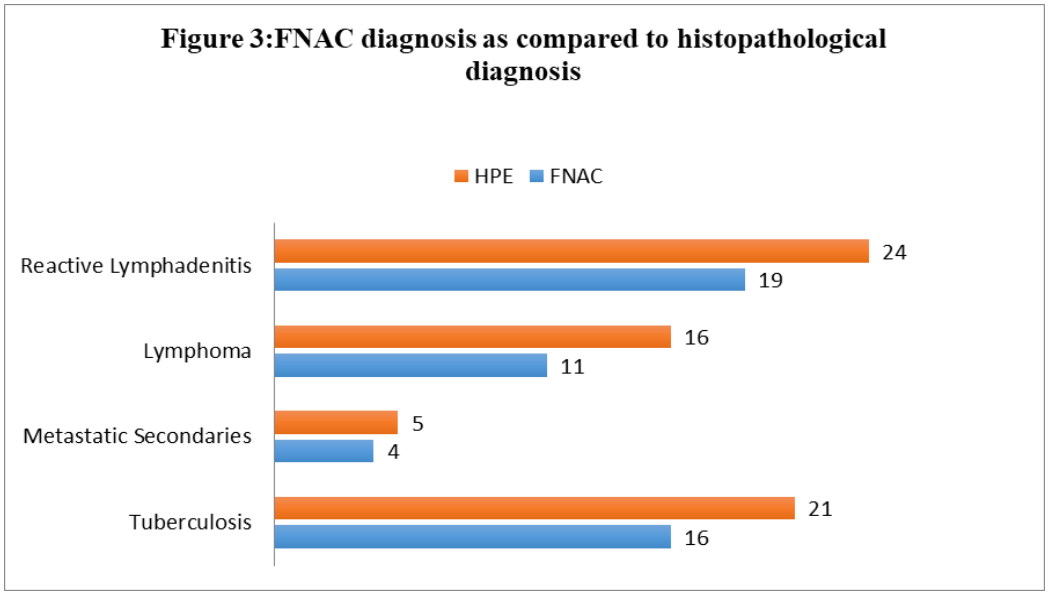
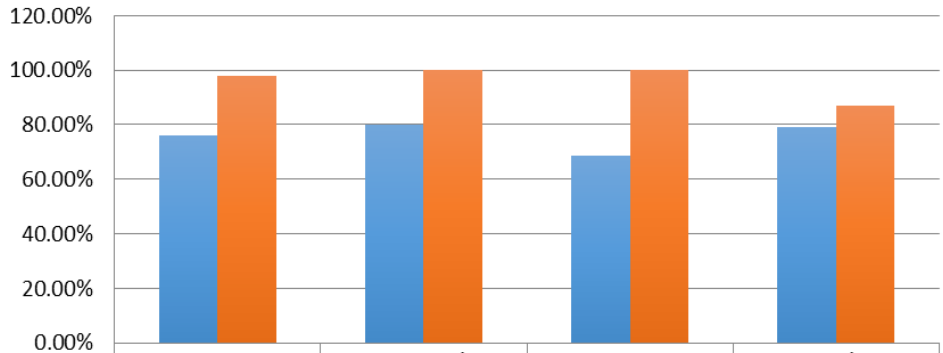


Figure 4:Sensitivity and specificity of FNAC



	Tuberculosis	Metastatic Secondaries	Lymphoma	Reactive Lymphadenitis
Sensitivity	76.20%	80%	68.75%	79%
Specificity	98%	100%	100%	87%

Upon calculating Cohen's Kappa coefficient to assess the level of correlation between FNAC and Open biopsy with the histopathological examination, the following results were obtained:

- Observed Agreement (P_o) = (a + d) / (a + b + c + d) = (13 + 45) / (13 + 6 + 3 + 45) = 58 / 67 ≈ 0.8657
- Expected Agreement (P_e) = ((a + b) * (a + c) + (c + d) * (b + d)) / ((a + b + c + d) * (a + b + c + d)) = ((13 + 6) * (13 + 3) + (3 + 45) * (6 + 45)) / ((13 + 6 + 3 + 45) * (13 + 6 + 3 + 45)) = (19 * 16 + 48 * 51) / (67 * 67) ≈ 0.5522
- Cohen's Kappa Coefficient (κ) = (P_o - P_e) / (1 - P_e) = (0.8657 - 0.5522) / (1 - 0.5522) ≈ 0.6016
- Therefore, based on the corrected data, Cohen's Kappa coefficient for comparing FNAC with biopsy is approximately 0.6016
- The strength of agreement measured by Cohen's Kappa coefficient can be interpreted as Moderate agreement

DISCUSSION

In our study, males and females were equally affected, with an M: F ratio of 1:1. However, in most studies, there was a slight male preponderance. In a study conducted by Alam J et al. (1), males were more affected, with an M: F ratio of 1.9:1.

In our study, the most predominant age group with cervical lymphadenopathy was 36-60 years, which is in line with Maheshwari A. et al. (7). A study done by Alam J. et al. (1) had predominantly younger patients in the 11 – 20 age group, while Kulal P et al. (5), Kokkonda PK et al. (6), and Batni G et al. (8) had patients predominantly in the 21 - 30 years age group.

In our study, the sensitivity and specificity were 76.2% and 98%, respectively, for tubercular lymphadenitis, 80% and 100% for metastatic secondaries, 68.75% and 100% for lymphomas, and 79% and 87% for reactive lymphadenitis. The overall sensitivity of FNAC in our study is 70.6 (68.5-72.7) with a 95% confidence interval. In a study by Kokkonda PK et al. (6), FNAC demonstrated a sensitivity of 80.3% and a specificity of 100% for tubercular lymphadenitis. In their investigation, Jha et al. (9) showed a sensitivity of 92.8% for detecting tubercular lymphadenitis. Chao (10) demonstrated 88% sensitivity and 96% specificity. A similar sensitivity of 83% for tuberculosis was observed by Dandapat et al. (11) in their study. A sensitivity of 84.4% for tuberculosis and 89% for

malignant secondary deposits was reported by Dasgupta et al. (12) in their study. Mondal et al. (13) found 100% sensitivity in the diagnosis of Hodgkin's disease, tubercular and pyogenic lymphadenitis, 98% for metastatic deposits, 97% for chronic nonspecific lymphadenitis, and 92% for non-Hodgkin's lymphomas in a larger sample of 444 cases. In their analysis of 2216 patients, Prasad et al. (14) found that the sensitivity and specificity for tubercular lymphadenitis were 83.3% and 94.3%, 97% and 99% for metastatic deposits, 80% and 98% for Hodgkin's disease, and 81% and 96% for non-Hodgkin's lymphomas.

Hence, the sensitivity of FNAC for tuberculosis in our study is 77.5%, which is concordant with the study by Kulal P et al. (5), and the specificity of FNAC is 100% for metastatic secondaries and lymphomas in our study, which is concurrent with Alam J et al. (4), Kokkonda PK et al. (6), Maheshwari A et al. (7), and Kulal P et al. (5)."

CONCLUSION

Cervical lymphadenopathy is a frequently encountered clinical condition that requires careful evaluation, analysis, and treatment by healthcare professionals.

Fine Needle Aspiration Cytology (FNAC) is a valuable initial investigation for cervical lymphadenopathy. It is a simple outpatient procedure that offers a rapid and specific diagnosis with minimal discomfort and is cost-effective (15). One of its primary advantages is the early detection of malignant diseases, enabling timely treatment initiation. However, the success of FNAC relies on two crucial factors: the representativeness of the sample and the high quality of the preparation. Achieving these can be challenging, so the most reliable diagnostic method is still histopathological examination.

When managing patients with cervical lymphadenopathy, it is essential to exercise sound clinical judgment to avoid delays in diagnosis and treatment, thereby improving patient outcomes.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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